

**Before the  
Federal Communications Commission  
Washington, D.C. 20554**

In the Matter of	)	
	)	
Promoting Investment in the 3550-3700 MHz Band;	)	GN Docket No. 17-258
	)	
Petitions for Rulemaking Regarding the Citizens Broadband Radio Service	)	RM-11788 (Terminated)
	)	RM-11789 (Terminated)
To: The Commission		

**COMMENTS OF  
OPEN TECHNOLOGY INSTITUTE AT NEW AMERICA  
And PUBLIC KNOWLEDGE**

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## Table of Contents

Executive Summary.....	4
I. PROPOSALS FOR LARGER AND PERMANENT PALs AMOUNT TO AN INDUSTRIAL POLICY TAILORED TO BENEFIT A SINGLE INDUSTRY SEGMENT AND EXCLUDE OTHER USERS AND INNOVATIVE USE CASES ...	7
A. CBRS is Designed to Encourage More Intensive, Localized Use of the Band by Market Entrants and Innovative Use Cases, Not Only Mobile Carriers .....	7
B. Investment and Innovation by New Users and for New Uses is Emerging, Facilitated by the Unique CBRS Framework .....	12
II. PROPOSED CHANGES TO PRIORITY ACCESS LICENSING RULES WOULD EXCLUDE COMPETING AND INNOVATIVE USERS AND USE CASES AND SHOULD BE REJECTED .....	19
A. Large License Areas Will Exclude Localized, Smaller and New Users, Undermining the Value of the CBRS Framework.....	19
1. Small PAL Areas are Most Efficient for CBRS Deployments Focused on Enhancing Capacity ....	20
2. Large PAL Areas Will Foreclose Small ISPs Serving Rural, Small Town Areas .....	22
3. Large PAL Areas Will Foreclose Localized Users and Use Cases .....	26
B. Longer PAL License Terms and Non-Competitive Renewal Create Expensive, Permanent Licenses that Foreclose the Ability of Market Forces to Easily Accommodate New Users and Technologies .....	29
III. THE COMMISSION SHOULD RETAIN DYNAMIC CHANNEL ASSIGNMENT .....	34
IV. CBSD REGISTRATION INFORMATION MUST BE PUBLICLY AVAILABLE TO OPTIMIZE PRODUCTIVE USE OF THE BAND AND HOLD SAS OPERATORS ACCOUNTABLE .....	35
V. CONCLUSION.....	39

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New America’s Open Technology Institute and Public Knowledge (together the “Public Interest Organizations” or “PIOs”), hereby submit these Comments in response to the Notice of Proposed Rulemaking (“*NPRM*”) in the above-captioned proceeding,<sup>1</sup> which seeks comment on proposed changes to the established framework for Priority Access Licenses (“PAL”) and other aspects of the Citizens Broadband Radio Service (“CBRS”). The Commission should reject any change to the existing CBRS Priority Access licensing rules. The PAL changes proposed in the *NPRM*, which track Petitions for Rulemaking filed by CTIA<sup>2</sup> and by T-Mobile USA, Inc.,<sup>3</sup> amount to an industrial policy that would tailor licensing rules to closely fit the mobile carriers’ wide-area business model and needlessly foreclose localized, innovative and potentially competing new users and uses by a broad range of enterprise, industrial and public sector users.

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<sup>1</sup> *Promoting Investment in the 3550-3700 MHz Band; Petitions for Rulemaking Regarding the Citizens Broadband Radio Service*, Notice of Proposed Rulemaking and Order Terminating Petitions, 32 FCC Rcd 8071 (2017) (“*NPRM*”). See also 82 Fed. Reg. 56193 (Nov. 28, 2017).

<sup>2</sup> See CTIA Petition for Rulemaking, GN Docket No. 12-354 (filed June 16, 2017) (“CTIA Petition”).

<sup>3</sup> See T-Mobile Petition for Rulemaking, GN Docket No. 12-354 (filed June 19, 2017) (“T-Mobile Petition”).

## Executive Summary

New America’s Open Technology Institute and Public Knowledge (hereinafter “OTI & PK”) urge the Commission to retain the current CBRS licensing rules and to proceed expeditiously to open the band for GAA use and, as soon as feasible, PAL assignments. The Commission should not fundamentally redefine Priority Access Licenses (PALs) and adopt an industrial policy that refashions PALs to tightly fit the business model of national carriers, thereby foreclosing potential competitors to, or substitutes for, the offerings of the largest mobile carriers. The Commission should instead adhere to the statutory objectives of Section 309(j) and trust market forces by retaining the rules the agency adopted unanimously in 2015. Larger license areas, long-term licenses and non-competitive renewal would convert the CBRS band from a flexible, small cell band that facilitates the widest possible variety of users and use cases, including rural broadband customized local enterprise solutions, into yet another band designed for the sole use and benefit of three or four national mobile carriers.

In crafting CBRS as a unique framework for small cell spectrum access, the Commission never intended PALs to be auctioned solely to fit the business model of national or regional network operators. The CBRS concept of making spectrum available on a “localized” and “targeted” basis is user- and industry-neutral. As the *CBRS Order* stated, the policy goal most consistent with Section 309(j) is to make PALs available and affordable to the largest possible number of users, including WISPs providing rural broadband, private “neutral host” LTE networks, office complexes, factories customizing machine-to-machine networks, utilities, airports, shopping malls, and sporting arenas. These localized and third-party uses may or may not have the same *capabilities* as a mobile carrier “5G” offering from the user’s perspective. That is a judgment the Commission should leave to the marketplace – as the *CBRS Order* wisely

did – rather than adopt an industrial policy fashioned by an incumbent industry segment to foreclose diversity, innovation and choice concerning America’s wireless future.

The underutilized 3550-3700 MHz band is already attracting substantial investment based on the technical and regulatory rules adopted by the Commission in the 2015 *CBRS Order*. The new framework’s combination of small area, short-term licensing (Priority Access Licenses) and band-wide opportunistic access, open to anyone (General Authorized Access), has so far stimulated interest, investment activity and innovative use cases that exceed expectations.

In rural and other low-density areas, auctioning PALs the size of PEAs, or even the size of counties, would make the licenses unaffordable for rural broadband providers or any wireless service other than a deep-pocketed wide-area cellular provider. A traditional licensing scheme based on exclusive access to very large geographic areas for inherently small cell deployments would not allow the largest possible number of businesses, individuals, nonprofit institutions and other entities the ability to self-provision capacity for mobile data offload, for neutral host LTE networks, or to customize highly-localized networks for machine-to-machine, smart city and other connectivity needs.

PAL areas as large as counties or PEAs are neither necessary for mobile carriers, nor a good fit for the technical characteristics of this band. Relatively low power levels make it an inherently small cell band, particularly in urban areas. Mobile carriers will not use CBRS to extend the coverage of their networks, but solely to enhance the capacity of their networks in targeted high-traffic and high-ARPU areas. The distinction between spectrum for coverage (which fits the traditional cellular licensing model) and spectrum for capacity in localized areas (which is the rationale for the PAL licensing scheme) is critical to understanding why the current PAL rules are better suited to achieve the statutory objectives of Section 309(j) – and even more

relevant for 5G in light of the fact that an increasing share of mobile device data traffic (currently over 80 percent) is consumed indoors, on a nomadic and not mobile basis. In addition, it would be far easier for national or regional carriers to assemble larger contiguous areas by acquiring census tracts than it would be for hundreds or thousands of small ISPs or individual enterprises to either justify the cost of a PEA or county license at auction.

As an alternative to large license areas and automatic renewal, if the Commission proposes that package bidding is in the public interest, we suggest that package bids be limited to three or at most four of the PALs (30-40 megahertz) in each census tract. This compromise could ensure that one or more licensees can achieve area-wide (even regional) quality of service, for at least a certain level of capacity, while in most cases leaving at least some PA spectrum available for more localized or small-area operators seeking only a single or small number of licenses.

Our groups also strongly oppose the NPRM's proposal to rescind public disclosure of the anonymized CBSD registration information used by SAS operators to calculate protection areas both between PALs and for the purpose of facilitating access to vacant PAL spectrum on a GAA basis. Under the current rules, Section 96.55(a)(3) is already less transparent than the Commission's other publicly-viewable (and accountable) databases for site-based licenses, including ULS and the TV Bands databases, which typically include not only location information, but the name and contact information of licensees. The public interest is served by enabling potential operators to investigate the feasibility of providing GAA services in an area before incurring costs, as well as by holding licensees and SAS operators accountable for erroneous or obsolete information that can over time undermine the efficient use of the band.

Finally, our groups oppose replacing dynamic channel assignment, managed by the SAS to protect Naval operations, with specific and static channel assignments.

## **I. PROPOSALS FOR LARGER AND PERMANENT PALs AMOUNT TO AN INDUSTRIAL POLICY TAILORED TO BENEFIT A SINGLE INDUSTRY SEGMENT AND EXCLUDE OTHER USERS AND INNOVATIVE USE CASES**

As OTI & PK opined in our opposition to the CTIA and T-Mobile Petitions, the proposed licensing changes have a single purpose: To change the fundamental character of the Priority Access Licenses (PALs) to tightly fit mobile carrier business models and, thereby, to foreclose potential competitors to, or substitutes for, the offerings of the largest mobile carriers. The *CBRS Order* the Commission unanimously adopted in 2015 made clear that its intention was to accommodate a far broader and diverse set of users and use cases, including rural Wireless ISPs (WISPs), utilities, enterprise broadband providers, private LTE networks (including neutral host networks in high-traffic venues), government agencies, schools and libraries. It remains unclear how the high-capacity, low-latency wireless networks of the future (with capabilities the carriers call “5G”) will be deployed and interconnect, but if current “4G” capabilities are any indication – with roughly 80% of mobile device data traffic dependent on a combination of Wi-Fi and *fixed* networks – the Commission would be wise to retain the industry- and technology-neutral framework of CBRS and reject changes that hobble smaller, rural ISPs and non-cellular providers and services.

### **A. CBRS is Designed to Encourage More Intensive, Localized Use of the Band by Market Entrants and Innovative Use Cases, Not Only Mobile Carriers**

Until the late 1990s, the FCC designed exclusive allocations to accommodate specific technologies and business models. The result was a Table of Frequency Allocations derided as “a fossilized record of fading services and technologies.”<sup>4</sup> This “command-and-control” approach became increasingly subject to criticism by advocates of both flexible licensing and unlicensed

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<sup>4</sup> Michael Calabrese, “Principles for Spectrum Policy Reform,” Working Paper, New America Foundation (Oct. 2001).

use. Highly-specified allocations designed with a particular industry or technology in mind can rapidly become obsolete or spectrally inefficient.<sup>5</sup> Beginning with the service rules for the new Personal Communications Service (PCS) spectrum allocated for mobile telephones in 1993,<sup>6</sup> the Commission began to allow licensees greater flexibility with respect to both services offered and technologies used.

Although PCS and subsequent mobile terrestrial (IMT) licenses were rightly lauded for offering “flexibility” with respect to *service rules*, the Commission has fashioned the licenses in very particular ways to advance a specific cellular industry business model based on wide-area coverage (very large geographic license areas), long terms (10 years), non-competitive renewability (permanent licenses), and GSM technologies (frequency division, allocating distinct uplink and downlink channels). The Commission’s policy with respect to licensing terms and geographic areas generally intended to facilitate wide-area networks offering ubiquitous coverage using relatively high power and expensive base stations. Achieving economies of scale and network effects justified designing licenses to facilitate national or (in the case of the most recent auctions) at least regional coverage networks.

Accordingly, the amortization period for coverage networks is many years, which justifies long terms. Similarly, the risk of coverage gaps encouraged carriers to push for license areas roughly as large their intended customer base. This spectrum industrial policy, initiated by the FCC under Chairman Reed Hundt, created tensions between national, regional and smaller carriers, as the Commission experienced in the debate that led to Partial Economic Area (PEA)

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<sup>5</sup> Covington & Burling, *Prospects for U.S. Spectrum Management* (June 2002), at 4. “Any narrow allocation locks in a particular technology or spectrum use” long after “it has been surpassed by an existing service or technology . . . or by an entirely new service or technology.” *Id.*

<sup>6</sup> See *Amendment to the Commission’s Rules to Establish New Personal Communications Services*, 8 FCC Rcd 7700 (1993).



licenses in the TV Incentive Auction, as advocated by the Competitive Carriers Association.<sup>7</sup>

And as the AWS-3 and other recent auctions demonstrate, the use case for very large geographic area licenses – and the auction winners – are predictably limited to large mobile carriers (typically national, sometimes regional, as in the case of PEAs).

**The CBRS band was intended to serve an entirely different purpose:** To protect federal incumbents and promote efficient and localized access to *spectrum for capacity*, CBRS is inherently a small cell band accessible on both a licensed and unlicensed (GAA) basis to a far larger and more diverse set of users and use cases. The three-tier framework of CBRS is intended to meet diverse and forward-looking needs: for both outdoor and indoor deployments, for fixed wireless as well as mobile deployments, and for machine-to-machine as well as PCS.

CTIA, T-Mobile, and their equipment suppliers (Qualcomm, et al.) spent several years arguing that PALs should be fashioned just like traditional cellular wide-area licenses. The Commission, in 2015 and again in 2016, rejected this traditional wide-area cellular licensing model, including on reconsideration after reviewing exactly the same arguments that CTIA and T-Mobile repurpose in cursory form in their new Petitions. The *CBRS Order* quite purposefully fashioned a spectrum access regime that “*make[s] the 3.5 GHz Band hospitable to a wide variety of users, deployment models, and business cases, including some solutions to market needs not adequately served by our conventional licensed or unlicensed rules.*”<sup>8</sup>

To date, the Commission has sought to *avoid* adopting a command-and-control style allocation that is fashioned to boost the prospects of one specific industry and/or business model.

With respect to license terms and renewability, the *CBRS Recon Order* made it clear that “even

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<sup>7</sup> See generally William Lehr and J. Armand Musey, *Right-Sizing Spectrum Auction Licenses: The Case for Smaller Geographic License Areas in the TV Broadcast Incentive Auction*, Summit Ridge Group (Nov. 20, 2013), available at <https://ecfsapi.fcc.gov/file/7520958842.pdf>.

<sup>8</sup> *Amendment of the Commission’s Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, 30 FCC Rcd 3959 (2015) (“*CBRS Order*”), at 3962 (emphasis added).

for large carriers, the economics and upgrade cycles for small cell use may resemble those for Wi-Fi deployments rather than traditional macro cell deployments.”<sup>9</sup> The Commission noted that non-renewable, short-term licenses are essential so that the broadest number of “users are able to efficiently target their use of the 3.5 GHz band to their specific needs . . . while permitting periodic market-based reassignment of these rights in response to changes in local conditions and operator needs.”<sup>10</sup>

With respect to geographic license areas, the *CBRS Order* never intended PALs to be auctioned solely to fit the business model of wide-area network operators. Quite the opposite is the case and, our groups believe, rightly so. The CBRS concept of making spectrum available on a “localized” and “targeted” basis is user- and industry-neutral. As the *CBRS Order* stated, the intention is to make PALs available and affordable to the largest possible number of enterprise and industrial users, including rural WISPs, private “neutral host” LTE networks, office complexes, factories customizing machine-to-machine networks, utilities, airports, shopping malls, college and other campuses, and sporting arenas (such as the NASCAR innovation described below). These localized and third-party uses may or may not have the same *capabilities* as a mobile carrier “5G” offering from the user’s perspective. That is a judgment the Commission should leave to the marketplace – as the *CBRS Order* wisely did – rather than adopt an industrial policy fashioned by an incumbent industry segment to foreclose diversity, innovation and choice.

Of course, the *CBRS Order* did not seek to exclude incumbent mobile carriers, which the Commission expected to be one of many industry segments benefitting from more localized and

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<sup>9</sup> *Amendment of the Commission’s Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, 31 FCC Rcd 5011 (2016) (“*CBRS Recon Order*”), at ¶ 45.

<sup>10</sup> *Id.* at ¶ 44.

targeted access to high-capacity spectrum.”<sup>11</sup> It is clear now that at least some mobile carriers will incorporate PAL spectrum into their networks to add capacity in urban and other high-traffic areas where the extra cost of network densification can be justified. At the same time, the Commission wisely adopted an industry- and technology-neutral approach that also looked ahead to the wide variety of high-capacity wireless networking solutions that are likely to be component parts of a future “5G” ecosystem -- including connectivity solutions customized and deployed by end users themselves, much as Wi-Fi is today. As the next section details, the *CBRS Order* correctly predicted that if mid-band, small area, and affordable PALs – together with additional GAA spectrum – are made available, innovative new users and use cases will emerge:

This regulatory adaptability should make the 3.5 GHz Band hospitable to a wide variety of users, deployment models, and business cases, including some solutions to market needs not adequately served by our conventional licensed or unlicensed rules. . . . Real estate owners can deploy neutral host systems in high-traffic venues, . . . Manufacturers, utilities, and other large industries can construct private wireless broadband networks to automate *processes that require some measure of interference protection and yet are not appropriately outsourced to a commercial cellular network*. Smart grid, rural broadband, small cell backhaul, and other point-to-multipoint networks can potentially access three times more bandwidth than was available under our previous 3650-3700 MHz band rules. All of these applications could share common wireless technologies, providing economies of scale and facilitating intensive use of the spectrum.<sup>12</sup>

Notably, as the highlighted sentence above suggests, the Commission specifically intended that PAL spectrum licensed for relatively localized geographic areas (census tracts) would allow a wide variety of industries and smaller operators to acquire “some measure of interference protection” for deployments that “are not appropriately outsourced to a commercial cellular network.” Unfortunately, these use cases – which the Commission anticipated could not

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<sup>11</sup> “Carriers can avail themselves of ‘success-based’ license acquisition, deploying small cells on a GAA basis where they need additional capacity and paying for the surety of license protection only in targeted locations where they find a demonstrable need for more interference protection.” *CBRS Order* at 3962.

<sup>12</sup> *CBRS Order* at 3962 (emphasis added).

rely on either GAA spectrum alone, or on off-the-shelf mobile carrier offerings – would be crippled by the CTIA and T-Mobile proposals to turn PALs into expensive and permanent licenses covering enormous geographic areas.

Finally, it's also important to realize that the wide variety of new uses and users the Commission sought to facilitate with its unique PAL licensing framework will also be far less likely to leverage the GAA half of the band if CTIA and T-Mobile succeed in their effort to effectively foreclose access to PALs. First, the enterprises that would need to rely on PALs to ensure interference protection, or quality of service, for at least a portion of their activities would not deploy at all – and so would also forsake the ability to leverage GAA spectrum for added capacity. And even the enterprises (and schools, libraries and other institutional venues) that felt comfortable relying entirely on GAA spectrum would likely face a diminished and considerably more expensive market for hardware and services. While a diverse and intensive use of PAL *and* GAA spectrum would likely fuel a mass market for off-the-shelf access points and other gear – much as Wi-Fi did on the unlicensed bands – a market geared initially and primarily to serve the proprietary needs of a few large mobile carriers would likely leave that potential mass market under-developed, if not dead in the water. And, no doubt, that would be a bonus for CTIA's members, who would then have most GAA spectrum for their own free use as well.

#### **B. Investment and Innovation by New Users and for New Uses is Emerging, Facilitated by the Unique CBRS Framework**

The underutilized 3550-3700 MHz band is already attracting substantial investment based on the technical and regulatory rules adopted by the Commission in the 2015 *CBRS Order*. The new framework's combination of small area, short-term licensing (Priority Access Licenses) and band-wide opportunistic access, open to anyone (General Authorized Access), has so far

stimulated interest, investment activity and innovative use cases that exceed expectations. The roughly 50 companies participating in the Wireless Innovation Forum have spent tens of thousands of hours developing technical standards to implement CBRS, while 82 companies – including chipmakers, mobile carriers, cable companies, equipment manufacturers, property managers, WISPs and others – have joined the CBRS Alliance.<sup>13</sup> According to a recent economic analysis by former FCC Commissioner Harold Furchtgott-Roth and published by CBRS Alliance, the estimated annual consumer surplus of CBRS ranges from \$8 billion to \$26 billion based on the assumption it will be accessible to a wide range of users and innovators.<sup>14</sup>

The CBRS framework allows even the smallest rural operators, market entrants and individual venues to access this small cell spectrum to pioneer or implement innovative new services. Rural areas are uniquely poised to benefit from advancements in the band. Rise Broadband, the largest fixed wireless internet service provider (WISP), is using its \$16.9 million grant from the FCC under the agency’s Rural Broadband Experiment program to deploy base stations today that are capable, once the Commission authorizes operations below 3650 MHz, of operating across the entire 3.5 GHz band.<sup>15</sup> This investment will fund ten projects in five states.<sup>16</sup> As the WISP Association (WISPA) has reported, many other rural WISPs are poised to

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<sup>13</sup> In the Wireless Innovation Forum, nearly 50 companies have been collaborating since 2015 to develop CBRS standards, while 82 companies from a broad range of wireless industry sectors have joined the CBRS Alliance to develop certification procedures, standards, and business opportunities for LTE-based CBRS systems. See <https://www.cbrsalliance.org/members>.

<sup>14</sup> Harold Furchtgott-Roth, *The Potential Market Value and Consumer Surplus Value of The Citizens Broadband Radio Service (CBRS) at 3550-3700 MHz in the United States*, CBRS Alliance (Nov. 2017), available at <https://www.cbrsalliance.org/whitepapers>.

<sup>15</sup> Joan Engebretson, *Rise Broadband Exec: Broadband Wireless Economics Are Better Than Ever*, Telecompetitor (April 14, 2016), available at <http://www.telecompetitor.com/rise-broadband-exec-broadband-wireless-economics-are-better-than-ever/> (crediting Rise Broadband Co-founder Jeff Kohler as asserting the CBRS band “could be a game changer . . . [t]hat type of spectrum [supports] faster speeds and can operate at slightly higher power”).

<sup>16</sup> See Letter from Stephen E. Coran, WISPA Counsel, to Marlene H. Dortch, FCC Secretary, GN Docket No. 12-354 (filed Apr. 7, 2017) (“WISPA Ex Parte Letter”).

replicate this approach to build out fixed wireless networks capable of extending broadband into unserved and underserved rural, small town and exurban areas.<sup>17</sup>

Investments in deployments based on the current CBRS spectrum framework are also targeting the market for private LTE and “neutral host” mobile service indoors and in hard-to-serve locations. Sercomm Corporation has developed products in cooperation with Federated Wireless that will deliver robust, in-home LTE network services using the 3.5 GHz band.<sup>18</sup> Hotel and other venue owners can “deploy LTE via the CBRS band at a fraction of the cost of installing a DAS network in the same location—which is the current preferred method of in-building deployments for cellular networks.”<sup>19</sup> Ericsson has already successfully tested its Radio System Architecture with Federated Wireless’ Spectrum Access Systems product.<sup>20</sup>

Another leading solution developed specifically around both small area PAL and GAA access to CBRS spectrum is Ruckus Wireless’s OpenG small cell product. Ruckus has collaborated with Qualcomm to use the 3.5 GHz band by “combining coordinated shared spectrum ... with neutral host-capable small cells to enable cost-effective, ubiquitous in-building cellular coverage.”<sup>21</sup> As the companies explained in their release, the strategy will make it “easy to deploy and provide an attractive total cost of ownership (TCO) while improving coverage and performance.”<sup>22</sup> These neutral host LTE networks, whether indoor or outdoor, can be both complementary and, at the end user’s option, competitive with mobile carrier service. Ruckus

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<sup>17</sup> *Ibid.*

<sup>18</sup> TekStadium Website, “Sercomm Corporation,” *available at* <https://www.tekstadium.com/vendor/sercomm-corporation/> (accessed July 24, 2017).

<sup>19</sup> Mike Dano, *Verizon, T-Mobile, Sprint join AT&T in eyeing LTE deployments in 3.5 GHz CBRS band*, Fierce Wireless (Mar. 1, 2017), *available at* <http://www.fiercewireless.com/tech/verizon-t-mobile-sprint-join-at-t-eyeing-lte-deployments-3-5-ghz-cbrs-band> (quoting Paul Challoner, vice president at Ericsson).

<sup>20</sup> *Ibid.*

<sup>21</sup> See Ruckus Wireless, “Ruckus Wireless Shares Vision for the Future of In-Building Cellular,” (Feb. 18, 2016), *available at* <https://www.ruckuswireless.com/press/releases/20160218-ruckus-wireless-shares-vision-future-building-cellular> (“Ruckus Press Release”).

<sup>22</sup> *Ibid.*

Wireless asserts the OpenG small cells will be generally available in the third quarter of 2017.<sup>23</sup>

David Wright, director of regulatory affairs and network standards at Ruckus, testified that Ruckus has been actively developing product for the 3.5 GHz band for the past two to three years and that “[m]ajor changes would upset expectations and undermine investment.”<sup>24</sup>

The current CBRS framework is also creating manufacturing, industrial, and Internet-of-Things (IoT) use cases. GE Digital, alongside Nokia and Qualcomm, developed a private LTE network for Industrial IoT using the CBRS band.<sup>25</sup> The companies will be integrating 3.5 GHz supported products into their Predix platform, which will serve as one of the pre-eminent architectures for the Industrial Internet.<sup>26</sup> A standalone LTE network that networks devices within a localized area has the power to improve performance and reliability for these industrial settings. Private, user-controlled networks relying on a combination of PAL and GAA spectrum can also be customized to serve factory automation and other end-user needs without the necessity of relying on what may turn out to be a less-than-optimal large mobile carrier offering. Telrad Networks, another CBRS Alliance member, announced in March introduced a new LTE Customer Premises Equipment offering that it noted is “especially suited for the CBRS band in the United States.”<sup>27</sup>

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<sup>23</sup> Sue Marek, “Why the 3.5 GHz CBRS Band Could Be a Breakthrough for 5G,” *SDX Central* (Mar. 10, 2017), available at <https://www.sdxcentral.com/articles/news/3-5-ghz-cbrs-band-breakthrough-5g/2017/03/> (“March SDX Central Article”).

<sup>24</sup> See generally Testimony of David A. Wright, “Facilitating the 21<sup>st</sup> Century Wireless Economy,” U.S. House of Representatives, Subcommittee on Communications and Technology (April 5, 2017).

<sup>25</sup> Qualcomm Press Release, “GE, Nokia and Qualcomm Unveil First Private LTE-based Trial Network Customized for Industrial IoT,” (Feb. 22, 2017), available at <https://www.qualcomm.com/news/releases/2017/02/22/ge-nokia-and-qualcomm-unveil-first-private-lte-based-trial-network> (“Qualcomm Press Release”).

<sup>26</sup> *Ibid.*; see also *March SDX Central Article*, supra note 24.

<sup>27</sup> Telrad Press Release, “Telrad Networks Announces New Customer Premises Equipment for LTE Networks,” (Mar. 15, 2017), available at <http://www.telrad.com/announces-new-lte-cpe/>.

Commitment to the current CBRS framework is especially important for equipment manufacturers and software companies with current investments and commitments. CBRS in 3.5 GHz band “fits perfectly with what we do with neutral-host cellular and Wi-Fi networks that we’ve been deploying,” asserts Derek Peterson, CTO of Boingo Wireless.<sup>28</sup> According to Boingo Wireless, the 3.5 GHz CBRS spectrum bands are “yet another innovative cycle for us to be able to take bandwidth and be able to find new ways to take advantage of neutral host bandwidth . . . There are a lot of new venue opportunities that we can take advantage that were kind of closed to us before where we were trying to use Wi-Fi to fill them.”<sup>29</sup>

Small cell company Accelleran has developed hardware that is specifically designed for the CBRS rules as they currently stand.<sup>30</sup> Qualcomm announced in February 2017 that its Snapdragon X20 modem will support CBRS spectrum, including neutral host LTE networking gear produced by OEMs such as Ruckus.<sup>31</sup> Huawei announced last year it plans to invest in CBRS and provide the gear for 3.5 GHz service.<sup>32</sup>

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<sup>28</sup> Monica Paolini, “Analyst Angle: A stronger appeal for a neutral-host model with CBRS,” *RCR Wireless* (Apr. 12, 2017), available at <http://www.rcrwireless.com/20170412/analyst-angle/analyst-angle-stronger-appeal-neutral-host-model-cbrs> (“April RCR Wireless Article”).

<sup>29</sup> *Ibid.* Derek Peterson, CTO of Boingo Wireless, is quoted regarding the CBRS band: There have been so many opportunities here for us that we’re excited about. We’ve got venues that we’ve worked with traditionally to get those rights where we’ve had challenges finding the right monetization or the right technical strategy to meet some of the needs of the venues. So I want to provide public safety services through an LTE network, but the only way to do today was you had to go work with an operator to try to lease a part of their spectrum, now with shared spectrum or unlicensed spectrum models with LTE, you don’t have to go lease that spectrum to meet those business needs.)

<sup>30</sup> See Accelarn Press Release, “Accelleran Brings Live 3.5GHz Small Cell Solution to MWC2017 and Announces New Small Cell Products,” (Feb. 27, 2017), available at <http://www.acceleran.com/acceleran-brings-live-3-5ghz-small-cell-solution-to-mwc2017-and-announces-new-small-cell-products/>. Accelleran CEO Frédéric Van Durme says the company “is at the forefront of the 3.5 GHZ innovation band and preparing the future with its virtualized software framework, ready for future mobile network architectures.” *Ibid.*

<sup>31</sup> See *March SDX Central Article*, supra note 24.

<sup>32</sup> See Monica Allevan, “Huawei ready to supply 3.5 GHz gear when operators need it,” *FierceWireless* (Sep. 26, 2016), available at <http://www.fiercewireless.com/tech/huawei-ready-to-supply-3-5-ghz-gear-when-operators-need-it>.



Finally, innovative network deployment has advanced under the current framework, and service providers will continue to innovate in the band given regulatory certainty. Last February, Nokia, Alphabet's Access Group and Qualcomm, in a partnership with NASCAR, used the CBRS spectrum band to build a “virtual reality zone inside stock car race cars,” streaming a 360-degree video streaming through YouTube Live Events in real-time.<sup>33</sup> The companies broadcast the event live in high-definition over a private LTE network relying entirely on the 3.5 GHz band. The companies wanted the trial “to act as a catalyst for carriers and enterprises to start thinking about leveraging this band for new applications.”<sup>34</sup>

The use of CBRS spectrum in the 3.5 GHz band has not only been tested, but is being looked at as a foundation for enterprises, campuses, venues and other groups to deploy private LTE networks. Nokia has also already built an LTE Small Cell product called Flexizone that is specifically tailored to the CBRS band for enterprises, venues and the hospitality industry.<sup>35</sup> This sort of innovative use of the 3.5 GHz band of spectrum shows precisely why the sharing structure of the CBRS rules was so key to helping companies in the space.

Many companies and coalitions are in the process of investing in future technologies using the CBRS spectrum-sharing rules. To date, Federated Wireless has been involved in 40 trials, ranging from technology trials to operational pilots, and expects to receive FCC

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<sup>33</sup> Qualcomm Press Release, “Nokia, Alphabet’s Access Group and Qualcomm showcase first live demo of a private LTE network over CBRS shared spectrum providing a 360° race car experience” (Feb. 7, 2017), available at <https://www.qualcomm.com/news/releases/2017/02/07/nokia-alphabets-access-group-and-qualcomm-showcase-first-live-demo-private>.

<sup>34</sup> *Ibid.* (attributing this quote to Chris Stark, head of strategy and business development in North America for Nokia).

<sup>35</sup> Nokia Press Release, “Nokia expands Flexi Zone small cell portfolio, boosting performance and simplifying deployment for operators and enterprises,” (Sep. 8, 2016), available at [http://www.nokia.com/en\\_int/node/2096](http://www.nokia.com/en_int/node/2096).

certification for its 3.5 GHz CBRS product before the end of 2017.<sup>36</sup> Federated Wireless has finished more than half of the trials and others are ongoing.<sup>37</sup>

Alphabet has also made investments in the CBRS space. The company has “helped address two of three requirements for the CBRS band to be ‘ready for prime time’ – including hardware development and development of a spectrum access system.”<sup>38</sup> Alphabet had completed an “end-to-end test of consumer devices connecting to CBRS base stations and formed a ‘trusted tester program’ designed to ensure interoperability between CBRS base stations and the spectrum access system set to manage resources.”<sup>39</sup> Nokia, Juniper, ZTE, Sercomm, Ericsson and Ruckus Wireless were among the companies to participate in the first set of tests with the Access SAS platform. In October of 2016, CBRS Alliance member SpiderCloud Wireless introduced what it touted as “the industry’s first enterprise small cell system that simultaneously offers LTE services on licensed spectrum and on the 3.5 GHz CBRS band.”<sup>40</sup> The company’s “dual-mode” system allows mobile operators and neutral host operators to “build a footprint of CBRS small cells before CBRS capable connected devices are widely available.”<sup>41</sup>

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<sup>36</sup> Monica Allevan, “Federated Wireless racks up 40 trials for 3.5 GHz CBRS spectrum sharing system,” *Fierce Wireless* (June 19, 2017), *available at* <http://www.fiercewireless.com/wireless/federated-wireless-racks-up-40-trials-for-3-5-ghz-cbrs-spectrum-sharing-system>.

<sup>37</sup> *Ibid.* “Currently, trials revolve around things like integrating with an operator lab or collecting operational requirements from a carrier, but [Federated Wireless CEO Iyad] Tarazi stopped short of naming names, saying more information is likely to become public near the end of the year.”

<sup>38</sup> Joan Engerbretson, “Private LTE Could Be Coming Soon, Thanks to Google CBRS Band Efforts,” *Telecompetitor* (Feb. 26, 2017), *available at* <http://www.telecompetitor.com/private-lte-could-be-coming-soon-thanks-to-google-cbrs-band-efforts/>.

<sup>39</sup> Dan Meyer, *Google division touts milestones in CBRS 3.5 GHz SAS tests, only deployments left*, *RCR Wireless* (Feb. 24, 2017), *available at* <http://www.rcrwireless.com/20170224/policy/Google+division-touts-milestones-in-cbrs-3-5-ghz-sas-tests-only-deployments-left-tag2>.

<sup>40</sup> SpiderCloud Wireless Press Release, “SpiderCloud Wireless Announces Industry’s First Dual-Mode CBRS System,” (Oct. 11, 2016), *available at* <http://www.spidercloud.com/news/press-release/spidercloud-wireless-announces-industry%E2%80%99s-first-dual-mode-cbrs-system>.

<sup>41</sup> *Ibid.*

In short, the proposed PAL rule changes would substantially impede the investment and innovation that has already started. Even reopening the rulemaking process creates uncertainty throughout the ecosystem, imposing a “chilling effect” on investment.

## **II. PROPOSED CHANGES TO PRIORITY ACCESS LICENSING RULES WOULD EXCLUDE COMPETING AND INNOVATIVE USERS AND USE CASES AND SHOULD BE REJECTED**

OTI & PK urge the Commission to reject the changes to the PAL framework proposed in the NPRM. Larger license areas, long-term licenses and non-competitive renewal is nothing but an industrial policy very purposely fashioned for the exclusive benefit of one type of provider (a handful of wide-area cellular providers) to the detriment of thousands of other users and use cases, some of which would compete directly with, or provide customized substitutes for, the services of those national and regional ISPs. The Commission’s 2015 *CBRS Order*, adopted 5-0 (with the support of four current commissioners), explained clearly why the PAL rules for this lower-power and flexible use band (allowing both fixed and mobile) would benefit the evolving wireless ecosystem by offering *interference-protected spectrum* for the first time to a diverse range of small ISPs (e.g., WISPs and co-ops), enterprise and industrial users. That rationale is more compelling than ever considering the outpouring of interest and investment by companies and sectors (industrial IoT, utilities, hospitality, property management, sporting arenas) since 2015.

### **A. Large License Areas Will Exclude Localized, Smaller and New Users, Undermining the Value of the CBRS Framework**

Auctioning licenses with coverage areas larger than census tracts would undermine the purpose of this small cell innovation band. In rural and other very low-density areas, auctioning PALs the size of PEAs or even counties would make the licenses unaffordable for rural broadband providers or any wireless service other than a deep-pocketed wide-area cellular provider. This foreclosure effect would be compounded by Petitioners’ proposals to make PALs

effectively permanent licenses through a combination of ten-year terms, automatic renewal, and limited or no build-out requirements. Even if there were build-out requirements, if they are based on population, mobile carriers would satisfy them (a decade hence) by building out almost solely in high-density and/or high-ARPU areas where the economic returns justify putting the spectrum to work. Since mobile carriers already have coverage spectrum and networks, the use of 3.5 GHz to densify networks with additional capacity would almost certainly be targeted at – and limited to – urban core and other high-traffic and high-ARPU locations.

***1. Small PAL Areas are Most Efficient for CBRS Deployments Focused on Enhancing Capacity***

PAL areas as large as counties or PEAs are neither necessary for mobile carriers, nor a good fit for the technical characteristics of this band. Relatively low power levels make it an inherently small cell band, particularly in urban areas. Mobile carriers will not use CBRS to extend the coverage of their networks, but solely to enhance the capacity of their networks in targeted high-traffic areas. The distinction between spectrum for coverage (which fits the traditional cellular licensing model) and spectrum for capacity in localized areas (which is the rationale for the PAL licensing scheme) is critical to understanding why the current PAL rules are better suited to achieve the statutory objectives of Section 309(j) to:

promote (i) an equitable distribution of licenses and services among geographic areas, (ii) economic opportunity for a wide variety of applications, including small businesses, rural telephone companies, and businesses owned by members of minority groups and women, and (iii) investment in and rapid deployment of new technologies and services.<sup>42</sup>

Unfortunately, the NPRM does not acknowledge the likelihood – or even the possibility – that the “5G” wireless ecosystem, just like the present 4G wireless ecosystem, will rely on a combination of national or regional carrier networks (that are truly ‘mobile’) and a far larger

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<sup>42</sup>47 U.S.C. § 309(j)(4)(C).

number of complementary, high-capacity and customized networks deployed by individual business firms, property managers and individual households to meet their particular needs at a lower cost. Today Wi-Fi, deployed at the edge, makes mobile data more fast and affordable. In a 5G world, private, indoor and customized small cell networks using LTE and possibly other technologies will further enhance the ecosystem.

This distinction between spectrum for coverage (traditional cellular networks) and spectrum for capacity (small cells, whether CBRS or Wi-Fi) is even more relevant for 5G in light of the fact that an increasing share of mobile device data traffic (currently over 80 percent) is consumed indoors, on a nomadic and not mobile basis. The benefits of “5G” – high throughput, low latency, and the ability to connect hundreds of different devices and sensors in a local area (e.g., IoT) – will be relevant almost entirely to indoor and high-traffic areas.

Indoors – as well as on corporate, school and other campuses – three of the ingredients most essential to traditional cellular networks (backhaul, power and siting) will be entirely under the control of the property owner. The missing ingredient is spectrum access. CBRS, with its current combination of small area PALs and GAA, provides an opportunity for small operators, individual venues, and neutral host and private LTE deployments to use the same interoperable equipment to access to both spectrum with interference protection (PALs) and much greater capacity on a best efforts basis (GAA).

License areas as large as PEAs or counties are not necessary to stimulate investment in mid-band spectrum and could easily lead to both a narrowing and a net reduction in overall investment and use of the band by excluding localized uses. As noted above, evidence for this is exemplified by investments in localized use cases by a wide variety of companies, including General Electric (real-time data connectivity for critical infrastructure and industrial use), CBRE

and the hospitality industry (neutral host LTE networks and customized private LTE networks), rural WISPs and other small ISPs (to address the rural broadband gap), and enterprise wireless equipment makers (e.g., for sporting arenas, such as NASCAR's recent trial using a private LTE network to broadcast 360-degree HD live video views from inside race cars). All of these localized uses of CBRS, to the extent they need or would benefit from PALs with interference protection, would be precluded under the Commission's draft NPRM.

Even if a carrier decides to use PALs to enhance capacity over an entire city (an enormous capital investment given the density of the low-power access points), there is no reason to secure a license that extends beyond the city, into exurbs, rural areas and neighboring counties, as PEAs would. It would be far easier for carriers to assemble larger contiguous areas by acquiring census tracts than it would be for hundreds or thousands of other potential users to either win a PEA or county license at auction. As explained further below, expecting that national or regional ISPs will have an incentive to partition PEAs or lease small portions of large license areas, through a secondary market transaction, is unrealistic both because of high transaction costs and because carriers have a disincentive to allow competitors with or substitutes for their services to access spectrum at a reasonable price.

## ***2. Large PAL Areas Will Foreclose Small ISPs Serving Rural, Small Town Areas***

Auctioning PALs as large as Partial Economic Areas, or even counties, will make the licenses prohibitively expensive for smaller and more locally-focused wireless providers (e.g., WISPs) seeking to offer service to smaller, more targeted areas. WISPs and other smaller operators do not have the capital or the economic business case to outbid national or regional wide-area cellular providers for licenses that often cover hundreds of square miles, millions of people, and/or very diverse areas including urban, suburban, rural and small town communities.

Providers seeking a license to offer service to a targeted area, such as a campus or shopping mall, would face a similar dilemma.

The most desirable PEAs from the perspective of a national mobile carrier typically include not only major metropolitan areas, but hundreds of square miles of diverse non-urban areas with substantially varying conditions. There are only 416 PEAs nationwide, 62 of which have populations in excess of 1 million.<sup>43</sup> Many (including New York and Los Angeles) include a major metropolitan market, but then extend more than a hundred miles inland as well, encompassing rural areas and hundreds of small towns where WISPs – but probably not national mobile carriers – could deploy on a targeted basis using 3.5 GHz spectrum. The PEA that includes the City of Los Angeles (population 3,976,322),<sup>44</sup> stretches east all the way across California to border the PEA for Las Vegas, Nevada. It also borders the PEA for Saint George, Utah. If a WISP or other service provider needs PALs to serve small towns or rural areas between Los Angeles and Las Vegas, it would be faced with the daunting prospect of paying many millions of dollars upfront for a license valued almost entirely by the fact it covers the City and County of Los Angeles.

The mismatch between PEAs and the use cases (and investment capital) of potential licensees other than major cellular carriers is not limited to PEAs that include major cities. Overall, 337 of the 416 PEAs cover an area with a population of more than 100,000 Americans. By comparison, the average population of census tracts, according to the Census Bureau, is 4,000

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<sup>43</sup> See Federal Communications Commission, “List of Partial Economic Areas with Corresponding Economic Areas” (“FCC PEA Boundaries”), available at [https://apps.fcc.gov/edocs\\_public/attachmatch/DA-14-759A2.pdf](https://apps.fcc.gov/edocs_public/attachmatch/DA-14-759A2.pdf).

<sup>44</sup> See United States Census Bureau, *QuickFacts*, Los Angeles (city), California (“*Census QuickFacts*”), available at <https://www.census.gov/quickfacts/losangelesciticallifornia>.

people.<sup>45</sup> For example, virtually the entire state of Maine is a single PEA. The state of Montana has six PEAs, but it also contains 271 census tracts. Another example is Puerto Rico, which is included in a single PEA.<sup>46</sup> Puerto Rico has a population of 3.4 million people<sup>47</sup> and a land area of 3,421 square miles.<sup>48</sup> While PEA licensing is good policy for wide-area coverage spectrum – such as the recent TV Incentive Auction – it is not good policy for low power, capacity spectrum with variable use cases. While large mobile carriers may be interested in PAL licenses to add capacity to their networks in San Juan or other coastal towns and resorts, most of Puerto Rico contains rural areas and villages. Local operators or other users could not possibly purchase a license for the entire island.

The NPRM also seeks comment on alternatives to PEAs, in particular counties. OTI & PK believe that auctioning PALs as large as counties create the same barriers to entry, innovation and investment as licenses the size of PEAs, only somewhat less so.<sup>49</sup> As a practical matter, PALs the size of counties would exclude virtually all other small wireless operators and use cases from acquiring interference protection as a cornerstone of a 3.5 GHz deployment. For a national or regional mobile carrier, the most desirable counties are those that contain the 50 largest metropolitan markets. But these same counties typically include, in addition, hundreds and in some cases thousands of square miles of diverse non-urban areas with significantly varying conditions – areas where big mobile carriers have little incentive to use this band to add

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<sup>45</sup> See United States Census Bureau, “Geographic Terms and Concepts– Census Tracts,” *available at* [https://www.census.gov/geo/reference/gtc/gtc\\_ct.html](https://www.census.gov/geo/reference/gtc/gtc_ct.html)

<sup>46</sup> See *FCC PEA Boundaries*, *supra* note 45.

<sup>47</sup> See *Census QuickFacts*, *supra*, Puerto Rico, *available at* <https://www.census.gov/quickfacts/PR>.

<sup>48</sup> See The Office of the Government of the Commonwealth of Puerto Rico, “Puerto Rico Facts and History,” *available at* <https://web.archive.org/web/20071212041552/http://www.prfaa.com/aboutpr.asp?id=30>.

<sup>49</sup> See Comments of OTI and Public Knowledge, GN Docket No. 12-354, RM-11788, RM-11789 (July 24, 2017) (“OTI/PK Comments”), at 20.



capacity, except possibly along busy highways or in a handful of high-traffic areas. Small ISPs, enterprise wireless providers and other localized use cases would be no more able to acquire most counties than they would a PEA.

While there are roughly 3,000 counties across the United States, many of these counties cover enormous areas that include rural, suburban, exurban and urban areas all within one county. Los Angeles County, for example, is home to 10,137,915 people and stretches roughly 4,057 square miles.<sup>50</sup> The county also incorporates vastly different types of areas. Hollywood (with sprawling studio complexes that might use a PAL for customized networks), downtown Los Angeles, Long Beach, and large parts of the Angeles National Forest–San Gabriel Mountains National Monument are all within Los Angeles County.<sup>51</sup>

Similarly, the neighboring county of San Bernardino County includes the city of San Bernardino (population of 216,239),<sup>52</sup> on the edge of metro Los Angeles, but it also sprawls eastward, covering over 20,000 square miles<sup>53</sup> of small towns, vast empty stretches of highway, as well as the Mojave National Preserve.<sup>54</sup> If you look at Coconino County, Arizona (which

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<sup>50</sup> See QuickFacts: Los Angeles County, U.S. Census Bureau, *available at* <https://www.census.gov/quickfacts/fact/table/losangelescountycalifornia/LND110210>.

<sup>51</sup> See Google Maps: Los Angeles County, *available at* <https://www.google.com/maps/place/Los+Angeles+County,+CA/@34.466741,-118.7652409,9z/data=!4m5!3m4!1s0x80dd2ad30164cd31:0x837d28d6cfbd392a!8m2!3d34.0522265!4d-118.2436596>.

<sup>52</sup> See QuickFacts: San Bernardino city, U.S. Census Bureau, *available at* <https://www.census.gov/quickfacts/fact/table/sanbernardinocitycalifornia,US/PST045216>.

<sup>53</sup> See QuickFacts: San Bernardino County, U.S. Census Bureau, *available at* <https://www.census.gov/quickfacts/fact/table/sanbernardinocountycalifornia/INC110215>.

<sup>54</sup> See Google Maps: San Bernardino County, *available at* <https://www.google.com/maps/place/San+Bernardino+County,+CA/@34.7852791,-117.2529163,8z/data=!4m5!3m4!1s0x80c52a8ae8311be5:0xa438bdbc918edca!8m2!3d34.9592083!4d-116.419389>.

stretches 18,618 square miles),<sup>55</sup> similar issues would arise for an area that includes Flagstaff, Ariz. (population of 71,459)<sup>56</sup> as well as the Grand Canyon National Park and large stretches of empty areas dotted with small towns.

These are just three examples of the similar problems auctioning PALs the size of counties could bring for a system that was designed to enable both small wireless ISPs and a wide variety of new users and use cases to bring connectivity to small, targeted areas. Licenses for counties as large and diverse as Los Angeles or San Bernardino Counties will only be affordable to incumbent wide-area mobile carriers, since the licenses that will be valued entirely by the dense city and suburban portion of the county. The ability to tailor PALs to be the size of a corporate or college campus, shopping mall or public venue, would be completely undermined by licenses as large as counties.

### ***3. Large PAL Areas Will Foreclose Localized Users and Use Cases***

More broadly, the foreclosure effect of large license areas – and expensive licenses – would be even more noticeable in metro markets. A traditional licensing scheme based on exclusive access to very large geographic areas for inherently small cell deployments would not allow the largest possible number of businesses, individuals, nonprofit institutions and other entities the ability to self-provision capacity for mobile data offload, for neutral host LTE networks, or to customize highly-localized networks for machine-to-machine, smart city and other connectivity needs. The opportunity loss and spectrum inefficiency inherent in auctioning

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<sup>55</sup> See QuickFacts, Coconino County, Ariz., U.S. Census Bureau, *available at* <https://www.census.gov/quickfacts/fact/table/coconinocountyarizona/RHI325216>.

<sup>56</sup> See QuickFacts: Flagstaff city, Arizona, U.S. Census Bureau, *available at* <https://www.census.gov/quickfacts/fact/table/flagstaffcityarizona/PST045216>.

very large geographic area licenses for a small cell band is particularly true for *indoor use*, where the connectivity needs of a wide variety of enterprise applications may not be well suited to commercial mobile network offerings, a reality the Commission acknowledged in its Spectrum Frontiers *NPRM*.<sup>57</sup>

Very large area and expensive licenses are not a good fit for small cell, high-capacity use cases. Because CBRS is a low-power, small cell band, it is a near-certainty that the vast majority of “5G” mobile carrier deployments will be small or microcell-sized. As a result, coverage areas for each cell will be small, with deployments by licensed providers likely focused in urban areas and within buildings. Licensing these bands on an exclusive basis across broad geographic areas, as desired by Petitioners, will ensure that residents and competitors will not be able to deploy 5G services in those areas not rapidly served by the licensees, or even to self-provision complementary or alternative high-bandwidth networks.

License areas as large as PEAs, or even as large as counties, are likely to leave the spectrum unused for many years, and perhaps indefinitely, in low-density and hence low-ARPU environments outside of central urban areas, shopping districts and well-trafficked venues. In contrast, the model proven to achieve the highest rates of spectrum re-use – and both fast and affordable connectivity indoors – is the open access *by both operators and end users* to low-power and small cell spectrum currently exemplified by Wi-Fi. At least in urban areas, where the CBRS technical rules limit PALs to very low power and small cell deployments, investment at the edge – for data offload, neutral host LTE networks, IoT and myriad other purposes – is, like

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<sup>57</sup> The Commission has stated it would be “highly efficient” to allocate some spectrum to “enable flexibility to facilitate a third type of network deployment: privately deployed networks that can provide 5G communications for advanced enterprise and industrial applications not suited to unlicensed spectrum or public network services.” *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services*, GN Docket No. 14-177, Notice of Proposed Rulemaking (rel. October 23, 2015), at ¶ 100.

Wi-Fi, far more likely to make widespread and more intensive re-use of the band than would result from exclusive control of PAL spectrum by a handful of national or regional wide-area operators.

At the same time, we acknowledge that national and regional ISPs have a legitimate concern about avoiding “coverage holes” (and reliance on GAA spectrum) for uses they market as a quality-of-service offering. Although wide-area operators have legitimate (if purely hypothetical) concerns about “exposure risk” if they are out-bid on most or all PALs in a few critical locations (e.g., Wall Street in Manhattan), we believe this rationale is overblown for at least several reasons: First, mobile ISPs will not be relying entirely on PAL spectrum for their gigabit-capacity 5G service. Carriers will aggregate PAL capacity, along with other bands, including (presumably) LTE over unlicensed mid-band spectrum at 5 GHz (which is also not guaranteed for QOS). A particular census tract may simply lose that limited capacity. Second, an auction of census tracts is the best market test of the highest and best use of a PAL is a particular community. Third, since two carriers could acquire all seven PALs, no mobile carrier can ever be guaranteed they will have access to PALs across an entire region.

Nonetheless, rather than adopt very large and static licensing areas (counties or PEAs) that completely foreclose PALs for localized users and uses, the Commission could reconsider package bidding for a limited number of PAL licenses. In the 2014 *FNPRM*, the Commission asked if it should adopt package bidding if it adopts “census tracts, or something smaller, as the appropriate geographic license area.”<sup>58</sup> Our groups opposed package bidding at that time, expressing the concern it could completely negate the benefits of small licensing areas. Most obviously, package bidding could deny even a single license to local entities seeking one or more

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<sup>58</sup> *Ibid.*

PALs for very localized purposes (e.g., covering a college campus, an office park or neighborhood) tailored to their need even if they were willing to bid more for that particular license than a large regional operator.

Therefore, as an alternative to large license areas, if the Commission decides that the risk of coverage gaps for large ISPs must be mitigated, we suggest that package bids be limited to three or at most four of the PALs (30-40 megahertz) in each census tract. This compromise could ensure that one or more licensees can achieve area-wide (even regional) quality of service, for at least a certain level of capacity, while in most cases leaving at least some PA spectrum available for more localized or small-area operators seeking only a single or small number of licenses.

**B. Longer PAL License Terms and Non-Competitive Renewal Create Expensive, Permanent Licenses that Foreclose the Ability of Market Forces to Easily Accommodate New Users and Technologies**

The foreclosure effect of PAL areas as large as counties or PEAs would be compounded by the NPRM's proposal to replace limited-term PALs, subject to competitive renewal, with 10-year license terms that renew automatically and bestow effectively permanent license rights. The NPRM proposes to continue the policy of turning exclusive licenses to access spectrum into a permanent entitlement, subverting market forces that could periodically test whether the assignment of a license today continues to be its highest and best use in 5, 10 or even 50 years when technology and the competitive landscape may be completely different. OTI & PK strongly support the balance adopted by the Commission in the *CBRS Order*: "Non-renewable, short-term licenses are an essential component of the overall framework . . . permitting periodic,

*market-based reassignment* of these rights in response to changes in *local conditions and operator needs*.<sup>59</sup>

Converting PAL licenses into traditional cellular industry licenses would make PALs prohibitively expensive and uneconomic for all but the largest wide-area mobile carriers in several respects. First, the cost of each PAL will be far higher, perhaps by a factor of 100-to-200 (based on the average number of POPs in PEAs and census tracts) and by an even higher multiple in the top 60 PEAs, each of which covers more than one million POPs. For example, as noted above, the PEA containing the City and County of Los Angeles – which stretches east and north to the borders of Nevada and Utah – has nearly 20 million people. This means that this single PEA – which would be purchased primarily based on its value in L.A. County – contains nearly 5,000 census tracts. Thus, a small wireless provider or other alternative user that would deploy in, for example, 100 census tracts, would need to be able and willing to pay at least 50 times as much per POP as it might if it could acquire spectrum in smaller increments.

Second, these unnecessarily high spectrum costs would be entirely frontloaded. The current PAL rules manage to help both *smaller companies and taxpayers* by effectively leasing PAL spectrum for shorter intervals. This lowers the upfront capital costs for market entrants and small operators, while ensuring a continuing return to the public in the form of periodic auction revenue that continues indefinitely. Periodic payments to the public will not only net more revenue over the long run, it will also match the amount paid at recurring auctions to the current value and use case of the band. This balance is not only a win-win for investment and taxpayers, but it boosts the economy longer term by encouraging more innovation and ensuring that spectrum assignments do not fossilize into under-performing public assets (as most bands

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<sup>59</sup> *CBRS Order* at ¶ 44 (emphasis added).

allocated decades ago do today). The Commission wisely anticipated this market-based and competitive refreshing of the CBRS band over time in the *CBRS Order*, stating:

Non-renewable, short-term licenses are an essential component of the overall framework. . . . permitting periodic, market-based reassignment of these rights in response to changes in local conditions and operator needs.<sup>60</sup>

Third, while census tracts cover a uniform number of POPs – and are thus far larger in rural than in urban areas – PEAs are highly variable, both in terms of population and geography. As the Commission’s listing of PEAs indicates at a glance, although there are 416 PEAs in total, the 10 largest PEAs include more than 100 million Americans because they are centered on (but extend in some cases hundreds of miles beyond) the very largest metropolitan markets (e.g., New York, L.A., Chicago). The population covered by those 10 range from nearly 6 million (Houston) to more than 25 million (New York City). As a result, *any* aspiring PAL holder in the top 10 PEAs, or even in the top 60 PEAs (all of which include more than 1 million POPs), will need an enormous amount of upfront capital and a use case to justify that expense. Not surprisingly, the only wireless operators fitting that description are the Petitioners.

Together, long and perpetual license terms, combined with license areas as large as counties or PEAs, will do their intended job of ensuring that small operators, market entrants, innovators and individual enterprises and local institutions (such as schools, libraries, public parks, harbors, et al.) do not have access to PAL spectrum, except perhaps for the lucky few that *might* find a mobile carrier willing to do a leasing deal in an area where it has no interest in building out. However, as the record responding to the CTIA and T-Mobile Petitions clearly shows, big ISPs have no obligation, no track record, and little if any incentive to partition or lease the unused portions of large license areas.

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<sup>60</sup> *CBRS Order* at ¶ 44.

WISPA stated in its comments opposing the Petitions: “historically, large carriers acquire licenses for large areas, build out in the urban core where the population is more dense, and warehouse spectrum in rural areas that could be used for broadband deployment.”<sup>61</sup> WISPA and other rural ISPs consistently report that despite inadequate fixed and mobile coverage in most rural areas – and huge swaths of spectrum unused by Verizon and AT&T – there is little evidence of an active market to partition or disaggregate unused carrier spectrum to meet that demand.<sup>62</sup> As Google observed in its comments, “the buy-and-hold behavior” of incumbent carriers in other bands suggests that once carriers acquire spectrum, that “do not relinquish it, even if goes unused or underused.”<sup>63</sup>

Moreover, unlike the big mobile carriers, WISPs (who typically rely on unlicensed spectrum) and new enterprise and industrial users will not have the benefit of aggregating CBRS spectrum (whether PAL or GAA) with exclusively licensed spectrum on other bands. For large ISPs, PALs represent *additional capacity* to augment carrier aggregation in high traffic and high ARPU areas – and not the single and only opportunity to customize an internal IoT, neutral host, or private LTE network that incorporates at least a modest amount of interference-protected bandwidth. While both large and small operator can fall back on the 80 megahertz of GAA spectrum to bridge a PAL coverage gap, many small providers do not view unprotected GAA spectrum as a viable substitute for the interference protection that accompanies a PAL. There are potentially thousands of industrial and enterprise networks, deployed to connect critical

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<sup>61</sup> Comments of WISPA, GN Docket No. 12-354, RM-11788, RM-11789 (filed July 24, 2017), at 25.

<sup>62</sup> See, e.g., Comments of Rural Wireless Assn and NTCA—The Rural Broadband Association, GN Docket No. 12-354, RM-11788, RM-11789 (filed July 24, 2017), at 5;

<sup>63</sup> Comments of Google, GN Docket No. 12-354, RM-11788, RM-11789, at 26 (filed July 24, 2017) (“incumbent carriers’ buy-and-hold behavior in other bands suggests that they likewise will not engage in partitioning or disaggregation here. . . . The truth is that the carriers, once they have spectrum, do not relinquish it, even if goes unused or underused.”).



infrastructure, for specialized IoT networks, telemetry, and for other sensitive communication, that have as much if not greater need for PAL spectrum.<sup>64</sup>

Even if national ISPs are willing to partition their licenses under certain circumstances, secondary markets are likely to be far more liquid and efficient in meeting the needs of a PAL licensee seeking to add census tracts than they would be in facilitating a partitioning of PEA or other large size (e.g., county-sized) licenses. National and regional ISPs are also in a far better position to navigate the complexities of secondary markets to expand their PAL footprint or capacity as compared to smaller and more local entities. OTI & PK agree that the option to partition or disaggregate a PAL could enhance the flexibility of secondary markets under the current licensing framework, particularly in rural areas where census tracts can be very large. However, the current “light-touch leasing” rule is the most useful tool for enabling secondary markets for PAL spectrum. The current leasing framework will make the market for PAL more liquid and more likely to attract purchasers who set themselves up as local wholesalers of leased access to individual enterprises and venues. In contrast, our groups believe it is speculative at best to conclude that partitioning and disaggregation would mitigate the preclusive impact of PAL areas larger than census tracts.

The Commission correctly concluded in the *CBRS Order* that “our decision not to impose specific construction requirements for PALs further increases the flexibility and fungibility of these licenses and reduces the barriers to fluid movement between service tiers.”<sup>65</sup> However, that decision presupposed small-area licenses that would not automatically renew after an initial three- or (at the initial licensee’s option) six-year term. If the license terms become longer,

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<sup>64</sup> See, e.g., Reply Comments of General Electric, GN Docket No. 12-354, RM-11788, RM-11789, at 3-7 (filed August 8, 2017) (“GE Relies on High-Throughput, Low-Latency Connections in the 3.5 GHz Band to Develop IoT, Telemetry, and Critical Infrastructure Applications”).

<sup>65</sup> *Ibid.*

permanent and affordable only to large mobile carriers, then CTIA and T-Mobile should also embrace strict build-out requirements.

OTI & PK propose that *if* the Commission incorporates any of the Petitioners' proposed PAL changes in a NPRM, that the agency should also propose short and strict build-out requirements *by census tract*. The only legitimate rationale that CTIA's members have for its proposed licensing changes is a fear that they may be outbid in certain census tracts and face a "coverage gap" with respect to a wide-area deployment. Given this rationale – and CTIA's insistence that having multiple PALs in *every* census tract is vital – the Commission should hold them to it by requiring deployment in *every* census tract. Any census tract not served after the initial license term should be returned for auction as a small area PAL – which, in any case, would be a far better fit with the small cell nature of the band and useful to other entities.

### **III. THE COMMISSION SHOULD RETAIN DYNAMIC CHANNEL ASSIGNMENT**

OTI & PK strongly opposes proposals to replace dynamic channel assignment, managed by the Spectrum Access System to protect incumbent Naval operations, with specific and static channel assignments. It is unnecessary because the Commission's Part 96 rules require a SAS to assign PALs held by the same licensee on a contiguous basis in a geographic area, to the extent feasible,<sup>66</sup> and assign the channels for multiple PALs held by the same licensee in a census tract to contiguous frequencies to the extent feasible.<sup>67</sup> The objective application of the rules by a SAS more avoids the possibility of anti-competitive gaming and meets legitimate needs for network planning.

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<sup>66</sup> 47 C.F.R. 96.25(b)(1)(i)

<sup>67</sup> 47 C.F.R. 96.25(b)(2)(i)

Specific and static channel assignments also would be undesirable for two reasons. First, it would create the potential for strategic and anti-competitive bidding aimed at denying other operators contiguous channels (geographically and/or within the same licensing area). For example, a bidder could pay a premium to occupy the middle three or four PALs, thereby ensuring that no competitor had more than two contiguous PALs in that local area. Worse, the bidder could take a different set of three or four channels in adjoining license areas, making it even more likely that a competitor could not assemble contiguous spectrum.

Second, specific and static channel assignments do nothing to reduce the likelihood or costs associated with dynamic channel assignment by the SAS. Under the current rules, Navy radar is ensured protection (both technically and politically) because when a PAL holder is notified it must clear off its licensed channel to protect military operations, the SAS temporarily relocates that licensee to GAA spectrum. There is no interruption of what the PAL holder expected to be quality of service spectrum, nor is there any disruption of Navy operations. However, if the national mobile carriers pay a premium for specific channel assignments, this will create an implicit expectation that they should not be subject to dynamic channel reassignment. The Defense Department should be expected to reconsider any agreement to share the band, since the obvious outcome of a second-stage auction premium will be the mobile industry pressuring Congress to require the Navy to vacate the band or restrict their operations to the GAA portion of the band.

#### **IV. CBSD REGISTRATION INFORMATION MUST BE PUBLICLY AVAILABLE TO OPTIMIZE PRODUCTIVE USE OF THE BAND AND HOLD SAS OPERATORS ACCOUNTABLE**

OTI & PK strongly oppose the proposal in the NPRM to rescind public disclosure of anonymized CBSD registration information used by SAS operators to calculate protection areas

between PALs and for the purpose of facilitating access to vacant PAL spectrum on a GAA basis. Under the current rules, Section 96.55(a)(3) makes basic CBSD registration information publicly available while obfuscating the identities of the licensees providing the information. This rule is, in fact, less transparent than the similar publicly-available information in the TV Bands Database, which includes a similar site-based registration requirement for access points; and it is less transparent than the Commission's other publicly-viewable (and accountable) databases for site-based licenses, including ULS, which typically includes not only location information, but the name and contact information of licensees.

WISPA correctly observes that CBRS is not an unlicensed service – and that public databases of spectrum licensing information has been standard practice for decades. “CBRS is ‘licensed by rule,’ such that the SAS essentially takes the place of ULS in identifying where the spectrum is in use,” WISPA explains.<sup>68</sup> This is an essential point: Each SAS operates on delegated authority to register and record licensing information on use of the public's airwaves.

There is no reason that the anonymized CBSD information for this particular band should be shrouded in secrecy while other apparently more expensive and high-power systems are disclosed in ULS and other Commission licensing databases. The so-called privacy and cybersecurity claims of Petitioners, to the extent they are sincere in the slightest, are not unique to this band. Google correctly points out that today virtually all mobile carrier “transceiver locations are visible to passerby, logged by crowd-sourced applications, and publicly documented.”<sup>69</sup> An example is T-Mobile's base station serving the Commission's headquarters. Anyone with Internet access can view the basic information on that deployment (eNB ID 51119) including not only the location, but “cell IDs, physical cell identity allocations, air interfaces,

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<sup>68</sup> *Id.* at 31.

<sup>69</sup> Google Comments at 28.

uplink and downlink frequencies used, and received signal strength.”<sup>70</sup> Far from being anonymized, the public can see the name and often the contact information for site-based licensees.

It is readily apparent that because CTIA and T-Mobile did not prevail in their previous efforts to preclude opportunistic access to vacant PAL spectrum, they are seeking secrecy as a backdoor means of undermining more efficient and intensive use of the entire CBRS band. In its *Second Report and Order*, the Commission facilitated opportunistic access to unused PAL spectrum (so-called use-it-or-share-it), in lieu of build-out requirements, by defining “use” of PAL frequencies on an engineering basis that established default and maximum (and, we believe, conservative) protection contours around PAL deployments.<sup>71</sup>

There are many productive reasons why users of the band benefit by database transparency, particularly with respect to what PAL spectrum is actually in use. Google has observed that “there are legitimate reasons to make this information publicly available, such as enabling potential operators to investigate the feasibility of providing GAA services in an area prior to incurring the cost of attempting to reserve specific spectrum.”<sup>72</sup> Keeping site-based deployments secret would make it nearly impossible for WISPs and other operators to assess whether there is enough vacant PAL spectrum in an area to support a deployment. We reject the notion that an adequate alternative to transparency is a SAS selling transparency for a fee. The Commission should not require rural ISPs, enterprise and industrial users, or consumer groups to pay a fee for a value-added SAS service simply to see licensing information that has historically been publicly available. Secrecy would also make it difficult for PAL holders to assess on their

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<sup>70</sup> *Id.* at 29.

<sup>71</sup> See *CBRS Recon Order and 2d Report and Order* at ¶¶ 174-179, 185-191.

<sup>72</sup> *Ibid.*

own why they might be experiencing interference, or to assess whether certain PALs are more likely to be available for auction because licensees have not built out.

Finally, holding licensees and SAS operators accountable for erroneous or obsolete information that can over time undermine the efficient use of the band is another important policy purpose facilitated by public access, as it is with all FCC licensing databases. Band incumbents and public advocacy groups can play a productive role in holding the SAS operators and other stakeholders accountable – but only if there is a meaningful level of transparency concerning the band’s actual use. The public should not need to trust a “black box” process controlled by competing SAS operators, some of which will be sponsored by consortia of PAL holders (e.g., CTIA) or under financial pressure to please the PAL holders that choose to use them (and pay them fees, including for value-added services).

For a well-known example of why public transparency and accountability is important when the Commission delegates its spectrum management authority to competing private database operators, look no further than the TV Bands Database. The National Association of Broadcasters has used the transparency of the TVBD to hold SAS operators (and some registrants) accountable for erroneous or expired registration entries which – if not corrected – could make the band sharing regime less efficient and even prone to heightened interference risk. The public interest stakes for transparency and accountability are far greater for CBRS, where it is military radar that needs to be protected by accurate registrations and where very valuable PAL spectrum could lie fallow indefinitely if there is no way to question potentially erroneous or expired SAS registrations.

## V. CONCLUSION

Our groups urge the Commission to retain the current PAL rules, particularly with respect to census tract license areas and competitive license renewal, and to focus instead on an expedited implementation of the rules as adopted in 2015 and 2016. The uncertainty and delay inherent in re-opening the rules for the exclusive benefit of one particular group of companies would not serve the broader public interest in our view. The CBRs is designed to promote innovation, competition, rural broadband access and consumer choice. The CTIA and T-Mobile proposals to tailor licensing rules to better fit the carriers' wide-area business model will needlessly foreclose localized and potentially competing new users and uses. We urge the Commission to reject any effort to backtrack on this unique achievement in forward-thinking spectrum policy.

Respectfully submitted,

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